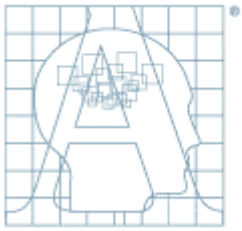

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Social Identity Simulation System (SISTEM)
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Introduction

The purpose of the SISTEM model is to create a proportional representation of real world populations and to simulate changes in the social identity of individuals resulting from actions taken by individuals and that leads to changes in affiliation and membership within different identity groups. Agents also engage in social actions that enhance groups to which they belong and degrade a targeted out-group. Identity groups that might be represented include both relatively fixed demographics (e.g. gender, ethnicity, education) and more dynamic affiliations (e.g. political, social). An agent's social identity may therefore consist of multiple identities across different groups that are considered influential in differentiating people within a population.

The agents in this framework update the state of their perceptions based on rational decisions by evaluating the costs and benefits of various actions in a given situation and selecting the action that maximizes the *(benefit—cost)* differential. Agents have twin objectives of self-enhancement and self-assessment. They seek to enhance their self-esteem while also engaging in social assessment and learning to ensure that their beliefs are still anchored with those of their peers. Agents maintain both a personal identity as well as social identity.

The **Background** section describes the general algorithms used within the model and the **Method** section describes the simulation model developed. The **Results** section provides an analysis of the model output, which are used to summarize the findings in the **Conclusions** section.

Background

The SISTEM agent based model is based on the literature review provided by the scientific authority managing this program. The social identity constructs and behaviors documented in the review were used as the basis for developing the algorithms used by the agents in the simulation model. The following subsections describe how these features are implemented. The primary objective function for each agent is to maximize its total self-esteem, which is the weighted sum of individual and social self-esteem:

$$\text{Total agent self-esteem} = W_i * \text{individual self-esteem} + W_s * \text{social self-esteem}$$

Where W_i is the weight that expresses how important the individual self-esteem is to the agent, and W_s is the weight of the social component which reflects the importance of the social identities for each group to which the agent belongs. As implemented, W_s is equal to $1-W_i$.The following section describes the **social identity** variables and equations that are used to arrive at the agent's total self-esteem. The subsequent section then discusses different **social identity management strategies or actions**.

Social Identity

Membership variables are divided the two primary categories: 1) state variables that are initialized at the beginning of a simulation and then updated over time as a result of membership actions, and 2) auxiliary variables that are derived from state variables to provide measures for reporting and for use in evaluating decision alternatives.

Common Variables

The following variables are used to denote common features across both the state and auxiliary variables and are also referenced when evaluating actions.

n = number of members for a given identity
k = individual
s = members of an individual's social network
p = total number of people
G = identity group (e.g. gender, ethnicity, etc.)
D = identity (e.g. male/female, White/Black/Spanish/… etc.)
R = real resources for an individual or identity.
′= Individual perception of a real value

W = weight

State Variables

The state variables that determine an agent's social identity for each identity within a group include the following:

- Permeability (P)
- Stability (S)
- Legitimacy (L)
- Individual Self Esteem (I)
- Affiliation (F)
- Identity status (T_D) and individual status within the group (T_k)
- Individual self-esteem weight (W_i)
- Social self-esteem weight (W_e)

The following subsections describe each of these state variables and how they are initialized in more detail.

Permeability

The permeability of an identity affects how attractive it is in reference to cost and resources. If the identity has a low cost of entry, then members of identities with lower resources are likely to enter into the identity and lower the per capita identity resources (Harth et al., 2008; Levin, Frederico, Sidanius, & Rabinowitz, 2002), thus impacting the resources that the agent is likely to receive from the identity. The initial perception of an identity's permeability is therefore initialized by the ratio of the perceived per capita resources of an identity (D) to a given individual's resources, where the perceived resources are drawn from a normal distribution based on the actual sum of identity member resources at the start of the simulation. This is to say that identities with higher per capita resources relative to an individual's will have a higher initial permeability. Thus the initial perception of permeability of an individual k for an identity *D* can be defined as follows:

$$P_k = \frac{\mathrm{R'}_D}{R_k \times n_D}$$

$\mathrm{R'}_D$ is the agent's perception of the group D's resources. R_k are the agent k's resources. As implemented, the initial permeability may also be overridden with a value from 0 to 1.

Stability and Legitimacy

An agent's perception of the stability and legitimacy of a given identity indicates how likely the identity's status differences will persist in the future, and therefore determine the future rewards that the individual members are likely to get by virtue of their membership in a given identity. The initial values for these variables are to be based on exogenous inputs and can therefore be defined as such:

Stability (*S*) and legitimacy (*L*) have values ranging from 0 to 1 and are to be assigned at initialization based on a distribution assigned to a given identity that is estimated by a subject matter expert (SME), polling data, or by the results of an analysis media describing the identity's legitimacy.

Individual Self-Esteem

Individual self-esteem is the personal component of the total self-esteem that depends on the evaluation of one's resources in comparison to other individuals within one's social network. The initial value is therefore assigned by dividing an individual's resources by the per capita resources of its social network.

$$I_k = \frac{R_k \times s}{R_s}$$

Where R_s is the total resources held by individuals within an agent's social network. Given this formulation, agents with more resources than their peers will have a higher individual self-esteem.

Affiliation

The affiliation an agent has for a given identity serves as a weight and valence for the status of the identity and can therefore be positive, negative, or neutral. A negative value indicates an adversarial relation with the identity, while a value near 0 indicates that one is indifferent to the identity. Likewise, a positive value indicates a positive affiliation with the identity. The initial value for affiliation is to be based on a distribution assigned by a SME, polling data, or by the results of an analysis of media describing perceptions across different identities.

F_k = Affiliation with a given identity, which has values ranging from –1 to +1.

Individual and Social Esteem Weights

The total agent self-esteem (discussed in the next section) includes weights for the individual and social component. These weights will be initialized from a distribution that is specified by SME input or polling data.

Auxiliary Variables

Additional identity variables are maintained as auxiliaries by each agent for use in making decisions and for reporting. An auxiliary variable is one that is based on combinations of state variables and is therefore not directly modified by actions or other model logic. The auxiliary variables for each agent include:

- Identity membership (*k*)
- Identity status (*T*)
- Social self-esteem (*E*)
- Total agent esteem (*A*)

Membership

An agent's membership with an identity is simply the identity the agent uses to self-identify within a given group. For the purpose of this model membership for fixed demographic identity groups like gender will be assigned at startup and will not change based on changes to its affiliation, but for the more dynamic identity groups like political affiliation, the identity with the highest affiliation value is used to determine membership. For any given group, the membership identity for the agent will be denoted with a *k*.

Status

An agent's perception of the status of a given identity (*D*) is based on the agent's socio-structural beliefs regarding the identity (i.e., the perceived stability, legitimacy, and permeability and is weighted by the identity's perceived per capita resources. The status (*T*) is therefore defined as such:

$$T_D = \frac{(\mathrm{S}_D + L_D)}{P_D} \times \frac{\mathrm{R'}_D}{n_D}$$

Under this formulation, when the status and legitimacy of an identity are high relative to the permeability, then the identity will be more exclusive, lending to its higher status. If the permeability is high, then it will diminish the identity's overall status. Status is normalized by dividing the calculated value by a maximum status that is based on the maximum per capita resources specified within the model.

In addition to the status of an identity, agents may have a status within a given group. This status is based on its resources compared to the per capita resources. The more an individual is above the per capita, the higher his status. Individual status is also normalized against the maximum per capita resources.

$$T_{k_D} = \frac{n_D \times R_k}{\mathrm{R'}_D}$$

Social Self-Esteem

An agent's perception of the social component of its self-esteem is essentially the sum of the product of the status and affiliation of all available identities for which they have a positive affiliation. An individual social self-esteem for other identities within a given group can also be calculated, but given the -1 to +1 range of

affiliation the cumulative social esteem cannot be appropriately maximized since some strategies would run counter to the objective of maximizing total esteem. For example some actions seek to deepen adversarial relationships, but by making affiliation more negative it would lower the cumulative social esteem instead of increasing it.

$$E = \mathrm{F}_{G1_{Dk}} \times T_{G1_{Dk}} + \mathrm{F}_{G2_{Dk}} \times T_{G2_{Dk}} + \cdots + \mathrm{F}_{Gn_{Dk}} \times T_{Gn_{Dk}}$$

Total Agent Self-Esteem

An agent's total self-esteem (A) as discussed at the beginning is therefore the sum of its weighted individual (W_i) self-esteem (I) and weighted social (W_e) self-esteem (E), where $\mathrm{W}_e = 1 - W_i$

$$A_k = W_i \times I + W_e \times E$$

Social Identity Management Actions

Agents make updates to the state variables using a variety of identity management strategies (Mummendey, Klink, Mielke, Wenzel, & Blanz, 1999). To decide which strategy and action to take an agent seeks to maximize its total esteem while balancing the various costs and benefits associated with an action. The result of an action is an update to one or more state variable and the corresponding impact on associated auxiliary variables. The following sections describe the different actions available and their corresponding costs and benefits. It should be noted that for a given evaluation period of the model, the agent selects only the action that maximizes its total esteem regardless of the outcome of the cost versus benefit analysis for a given action.

Individual Actions

Individual actions are ones in that are entirely independent of the actions of other agents. The actions included in this model are mobility and individuation.

Mobility

Mobility refers to strengthening one's affiliation with a different social identity within a given group in order to improve one's status. Mobility also depends upon the target identity's intergroup permeability. When individual agents perceive that the expected benefit of weakening their affiliation with a lower status identity and strengthening their affiliation for a higher status identity outweighs the expected costs, they will update their affiliations accordingly. An individual's estimate of the cost of leaving the in-group identity and joining the out-group identity will be inversely proportional to the perceived permeability of the out-group identity.

$$Cost_{D1 \to D2} = \frac{1}{\mathrm{P}_{D2}}$$

The estimate of the benefits is proportional to the status difference between the two identities. That is, individuals "disassociate from the identity and pursue individual goals designed to improve their personal lot rather than that of their in-identity" (Haslam, 2001).

$$Benefit_{D1 \to D2} = T_{D1} - T_{D2}$$

If the cost is less than the benefit, then the affiliation with identity one is decremented by the percentage difference of the ratio and a given weight (W_a) or speed of adjustment while the affiliation with identity two is incremented by the same amount.

$$\text{If } Cost_{D1 \to D2} < Benefit_{D1 \to D2} \text{ Then } \begin{cases} F_{D1} = F_{D1} - \left(1 - \dfrac{Cost}{Benefit}\right) \times W_a \\ F_{D2} = F_{D2} + \left(1 - \dfrac{Cost}{Benefit}\right) \times W_a \end{cases}$$

After updating, the identity with the highest affiliation will be the identity with which the agent self-identifies for membership. As a result of the action the individual also has to pay the cost out of its individual resources. Thus after moving, the individual's resources are decremented accordingly.

$$R_k = R_k - \frac{1}{P_{D2}}$$

Individuation

Individuation refers to when an individual attempts to preserve self-esteem by psychologically separating oneself from a devalued identity, and instead focuses on personal identity. This shift from social to personal self-categorization (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) is such that individuals no longer define themselves as identity members, but as unique individuals who are less affected by identity evaluations (Ng, 1989). This individual strategy allows people to escape from their own negative social identity while the evaluation of other identity members remains unchanged.

The cost then is based on the amount of self-esteem lost by decrementing the agent's weight for social esteem by a set amount (α):

$$Cost = (W_e - \alpha) \times E$$

And the benefit is esteem gained by increasing the weight of the individual component by the same amount:

$$Benefit = (W_i + \alpha) \times I$$

If the gain in esteem is greater than the esteem lost, then the weights are adjusted accordingly.

Collective Actions

In addition to individual actions agents may take actions as part of a collective. The collective actions are driven by social identity entrepreneurs (SIDs) (Haslam & Reicher, 2007; Lal, 1997). These are individuals who because of their stronger affiliation for the group have more at stake in the group' status and therefore are more strongly motivated to call others to engage in collective actions to enhance their group's status when they find an opportunity to do so. As rational individuals, social identity entrepreneurs only advocate a collective action on behalf of the group when they perceive benefits of advocating being greater than its expected costs. The following subsections describe various strategies of social identity entrepreneurship in more detail.

Calling for Collective Action against an Out-group

Some high status group members call their fellow group members to join in collective action against out-group members when they believe that benefits of making such calls outweigh costs of doing so. An agent can expect to receive both personal and social benefits by calling for collective action against out-group members and from the actual social action that may follow such calls.

Expected personal benefits of making such calls include:

1. A large gain in one's personal status in the group as people adhere to the message. Addition of each new adherent results in an increase in the status of the social identity entrepreneur.

$$Benefit = T_{k_D} + \alpha$$

2. Establishment of new social connections with those who adhere to the call, where s^* is new total members, leading to a positive change in individual self-esteem (I).

$$\text{Benefit} = \Delta I_k = \frac{R_k \times s^*}{R_{s^*}}$$

Expected social benefits of making such calls include:

1. A gain in the group status through the change in the group beliefs/behaviors that the message is seeking to cause in the group members.

$$\text{Benefit} = T_D + \alpha$$

Expected personal costs of calling others to collective action on behalf of the group include:

1. Costs of message creation, design and dissemination are deducted from one's personal resources

$$Cost = \mathrm{R}_k - \alpha$$

2. A loss of personal status within the group if either enough people do not join or if the effort does not succeed.

$$Cost = \mathrm{T}_{k_D} - \alpha$$

3. A loss of connections with those who are opposed to the collective action, where s^* is new total members, leading to a negative change in individual self-esteem (I).

$$Cost = \Delta I_k = \frac{R_k \times s^*}{R_{s^*}}$$

Expected social costs of calling others to collective action on behalf of the group include:

1. Loss of group resources if enough group members join but the action does not succeed.

$$\mathrm{Cost} = \Delta \mathrm{R_D} = \sum_{\mathrm{k}}^{\mathrm{n}} \alpha$$

Decision Criteria

An agent will decide to call others to collective action if they believe that the chances of their call-to-action being able to attract enough adherents and the chances of the collective action succeeding are high. This is the case if:

- The agent has enough resources to engage in creation, design, and propagation of the message (this includes both monetary resources to pay these costs and a large social network needed to communicate the messages to): $\mathrm{R_k} > \beta$
- the agent's status within the group is high: $\mathrm{T}_{k_D} > mean + \sigma$
- agent's affiliation for the group is high: $\mathrm{F} > mean + \sigma$
- agent's in-group has higher level of relevant (e.g., martial resources if the conflict is an armed one, or creative resources if the conflict is an intellectual argument) resources compared with the out-group: $\mathrm{R_{D'}} > \mathrm{R_D}$
- the agent has reasons to believe that a majority of its social contacts are pro-collective action: $\frac{s^*}{s} > 0.5$

Joining Collective Action against Out-group

When a group member believes that it has more to gain from joining in collective action than the potential costs of joining in, it will do so. An agent can expect gains in both its social as well as personal self-esteem because of its actions that support collective action by its in-group members against an out-group.

Expected personal benefits include:

1. A small increase in one's status in the group.

$$Benefit = \mathrm{T_{k_D}} + \alpha$$

2. Establishment of new connections with the SID who called for action and with fellow adherents

$$Benefit = \Delta \mathrm{I_k} = \frac{\mathrm{R_k} \times \mathrm{s}^*}{\mathrm{R_{s^*}}}$$

Expected social benefits include:

1. A small gain in group's status if the collective action is successful.

$$Benefit = \mathrm{T_D} + \alpha$$

A collective action against the out-group (D′) is more likely to be successful if:

a. A large percentage of one's in-group members are willing to join the attack: $\frac{s^*}{s} > 0.5$
b. If the out-group's status is believed to be illegitimate: $\mathrm{L_D} > \mathrm{L_{D'}}$
c. If the out-group's status is believe to be unstable: $S_\mathrm{D} > \mathrm{S_{D'}}$
d. Out-group's martial resources are less than in-group's martial resources: $R_D > \mathrm{R_{D'}}$

Expected costs of joining in an attack against an out-group include personal as well as social costs.

Personal costs include:

1. Loss of one's personal resources including one's life and health and the life and health of one's family and friends

$$Cost = \mathrm{R}_k - \alpha$$

2. A small loss of personal status if the social action is unsuccessful and a large loss if the individual's incompetence is seen to have contributed to the group's loss

$$Cost = \mathrm{T}_{k_D} - \alpha$$

3. Loss of connections with opponents of collective action

$$Cost = \Delta I_k = \frac{R_k \times s^*}{R_{s^*}}$$

Social costs include:

1. Loss of group resources if the collective actions is unsuccessful

$$\mathrm{Cost} = \Delta \mathrm{R_D} = \sum_{\mathrm{k}}^{\mathrm{n}} \alpha$$

Decision Criteria

An agent will join a call to engage in collective action if it believes that the call is credible and the chances of the action being successful are high. This is likely to be the case when:

- Call comes from an in-group member whose status is higher than the agent itself. The higher the difference in status, the more likely is the agent to engage in the action: $\mathrm{T_{k_D}} < \mathrm{T_{k'_D}}$
- Majority of agent's social network connections have decided to join the collective action: $\frac{s^*}{s} > 0.5$
- Agent's in-group has higher level of relevant (e.g., martial resources if the conflict is an armed one, or creative resources if the conflict is an intellectual argument) resources compared with the out-group. $R_D > \mathrm{R_{D'}}$

Collective actions can impact all of the socio-structural beliefs of legitimacy, stability, permeability as well as group resources. Our model focuses on the following collective actions:

- Raising and Lowering Group Boundaries
- Glorifying in-group
- Attacking an out-group
- Delegitimizing an out-group
- Denigrating an out-group

An identity group decides which action to take by evaluating the cumulative scores by members that have elected to participate in an action. These scores are used to create a distribution which is then randomly sampled

to select the action. Individual scores are evaluated by each agent by taking the difference between the current total esteem and the resulting esteem given a successful action for each type.

Raising/Lowering Group Boundaries

Raising Boundaries

An agent will engage in calling-others/joining-in group boundary raising action if it believes that the gain in group status obtained by raising the cost of entry for outsiders outweighs the costs of preventing potential new members who can contribute to the group resources. It compares the average resources a newcomer contributes to the group resources to the average resources that a newcomer takes from the group. In order to estimate both these amounts the agent relies on the new members that it knows about and its perceptions of how much they have taken from and contributed to the group resources.

$$\mathrm{P} = \mathrm{P} + \alpha$$

Lowering Boundaries

An agent will engage in calling-others/joining-in group boundary lowering actions if it believes that the gain in group resources expected from the contributions of the new potential members will outweigh the costs of group resources being taken by the new members.

$$\mathrm{P} = \mathrm{P} - \alpha$$

Glorifying in-group (Raising in-group's legitimacy perceptions)

This happens when group members believe that the social benefit it is likely to obtain due to higher in-group legitimacy perceptions is greater than the costs of creating and disseminating hierarchy enhancing myths about how in-group acquired its resources (the costs of creating and disseminating such myths may be higher if they are far different from current group beliefs as well as reality).

$$\mathrm{L} = \mathrm{L} + \alpha$$

Attacking an out-group

Members of a group are likely to call-for/join-in an attack on an out-group if they believe that their action is likely to be successful. This is likely to happen when

- the status hierarchy is unstable: $S_{\mathrm{D}} > \mathrm{S}_{\mathrm{D}'}$
- the out-group's legitimacy is lower than the in-group's legitimacy: $L_{\mathrm{D}} > \mathrm{L}_{\mathrm{D}'}$
- the in-group has a higher level of martial resources than the out-group: $R_{\mathrm{D}} > \mathrm{R}_{\mathrm{D}'}$

When an attack is successful, each agent of the targeted identity is decremented a fixed percentage of resources to provide a total spoils. These spoils are then divided amongst members of the attacking identity based on their status within the group.

Delegitimizing an Out-group (Lowering Out-group Legitimacy perceptions)

This happens when an agent believes that the gain in status due to lower out-group legitimacy perceptions is greater than the costs of creating and disseminating grievances and illegitimate group behavior myths about how to out-group acquired its resources (the costs of creating and disseminating such myths may be higher if they are far different from current in-group beliefs as well as reality).

$$\mathrm{L}_{\mathrm{D}'} = \mathrm{L}_{\mathrm{D}'} - \alpha$$

Denigrating an Out-group (Lowering out-group stability perceptions)

This happens when group members believe that the gain in status due to lower out-group stability perceptions is greater than the costs of creating and disseminating stories about how the out-group's status is in decline.

$$\mathrm{S}_{\mathrm{D}'} = \mathrm{S}_{\mathrm{D}'} - \alpha$$

Method

The SISTEM model was implemented within AnyLogic, a Java based multi-paradigm modeling environment. The model and source code have been uploaded to the following URL: http://www.runthemodel.com/models/k-xJeA6NdoM4psSZOcMsLr/

Model Interfaces

The model can be run using both single run and multi-run configurations. Figure 1 shows the simulation start screen. From here users can setup a simulation or select "Use Random Distributions" to begin a multi-run session that uses randomly selected ranges for the agent initialization variables (shown in Figure 3). Otherwise users may return to this screen after setup to conduct a multi-run using the distributions specified by the user.

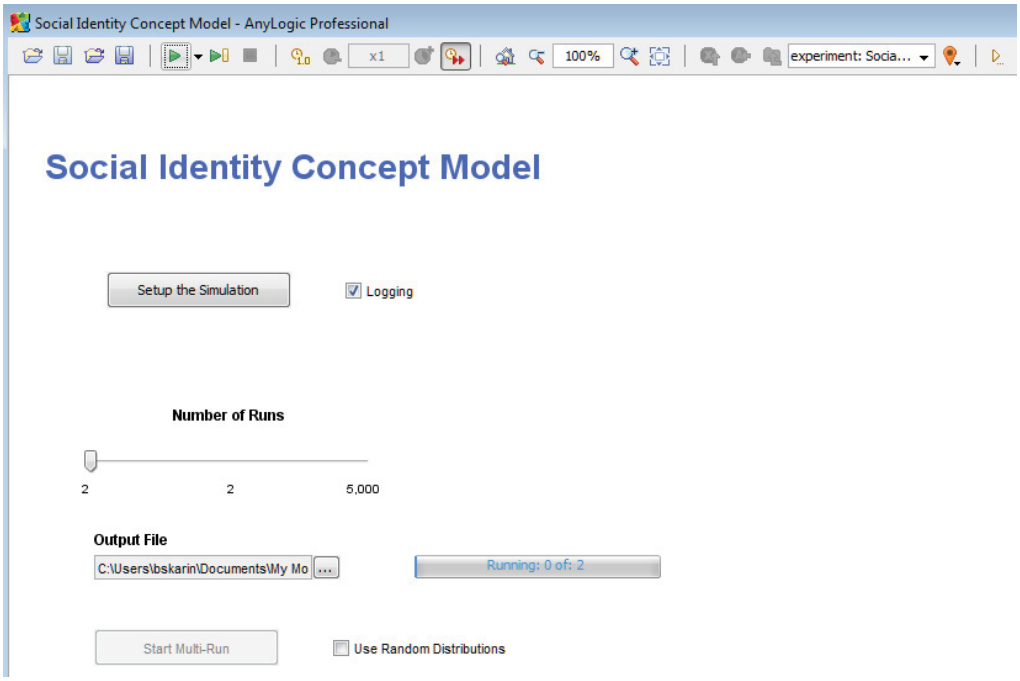

Figure 1: SISTEM start screen

Figure 2 is a screenshot of what is displayed after entering the model setup. From this screen users can configure the number of agents, the type of network, and the network layout. Users can also configure the initial distributions for agent variables by clicking "Agent Variables." After configuring the model, users may either start the simulation for a single run or select "Setup Multi-Run" to return to the initial screen for configuring a sensitivity analysis. During simulation the screen displays the agents and their actions along with stats on the actions of the different identity groups. Clicking on an agent will bring up additional information about the agent along with an option to navigate to detailed identity data as shown in Figure 4.

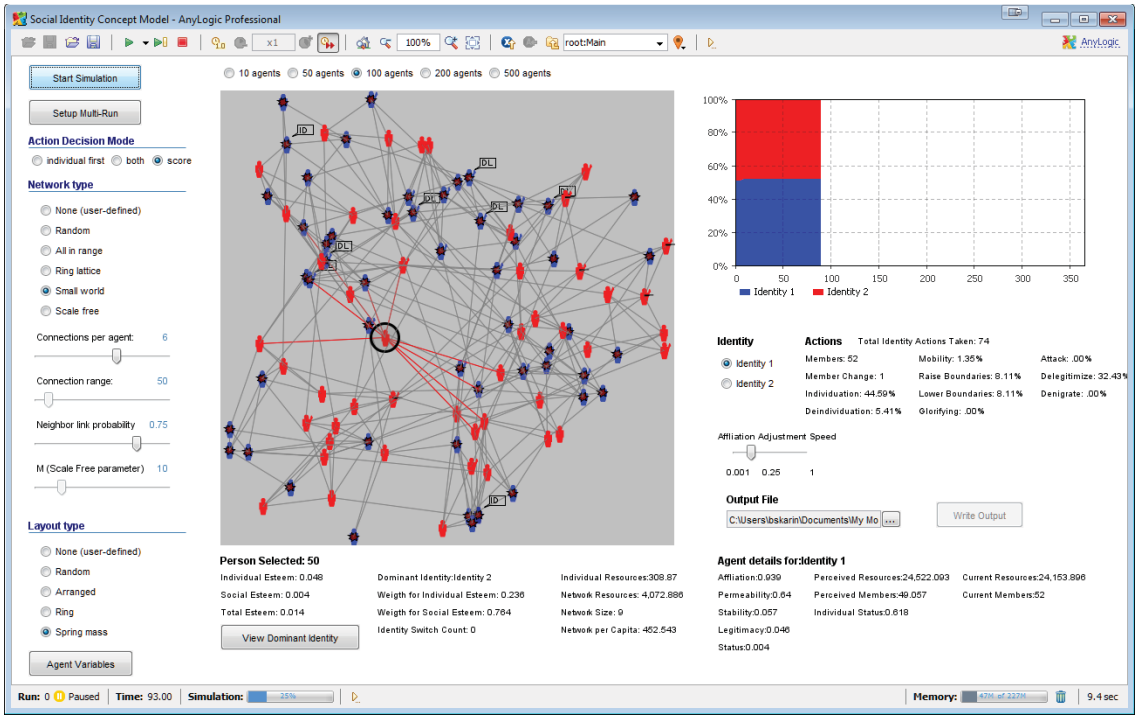

Figure 2: SISTEM model simulation screen

After a simulation is complete, CSV files can be written out to report the actions of identities during the simulation by specifying a file and clicking "Write Output".

In addition to the network options, the initial values for agents can be configured by selecting "Agent Variables." Figure 3 shows the options for this screen. By selecting member identity, the user will be changing the values for perceptions of the corresponding identity (when applicable). Users have the option to select a variety of different distribution types and parameters. Changes are saved when the user clicks "Apply Changes." These distributions can be used both in single and sensitivity analysis runs and may be changed midstream within a given run to simulate the occurrence of an exogenous event.

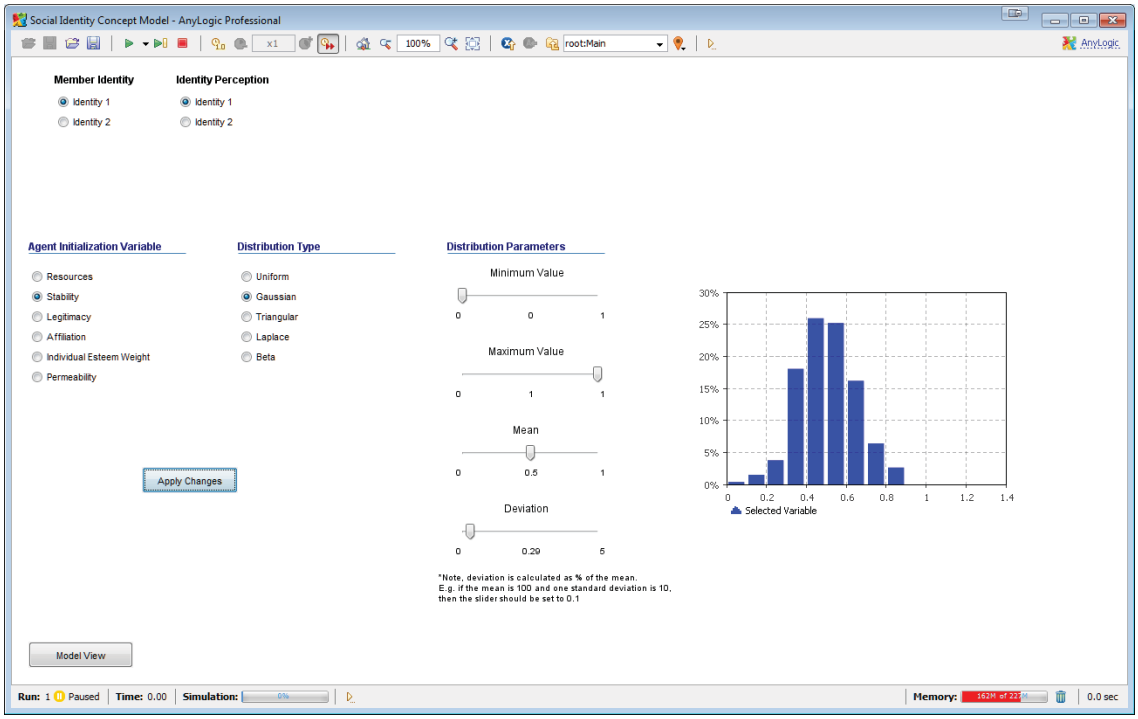

Figure 3: Agent variable configuration screen

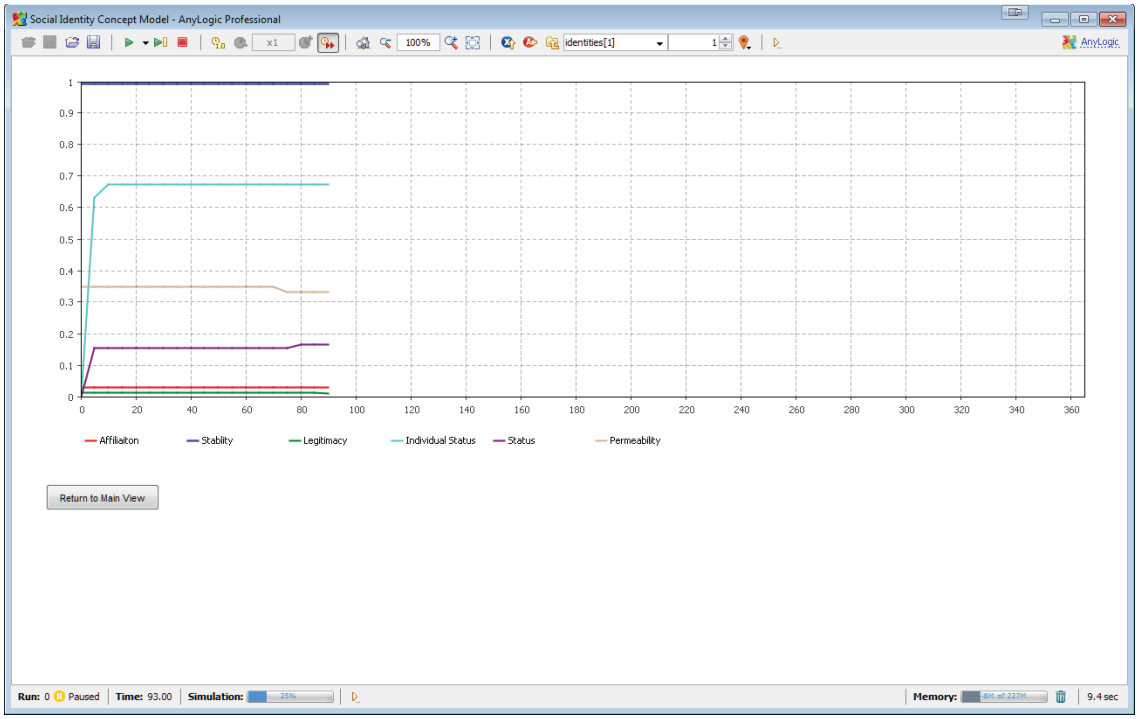

Figure 4: Detailed agent identity data

Model Analysis

To explore the full range of model behavior and sensitivity to parameters, a variety of experiments were setup. The largest experiment was a collection of ten thousand runs that used the random distributions to explore how different combinations of ranges for resources, permeability, legitimacy, stability, and the individual esteem weight affected the frequency of all the different actions.

The range for an agent's initial resources is zero to one thousand. The random distributions were spaced at intervals of one hundred. All the remaining variables are based on a zero to one range so intervals were spaced at every one tenth. The affiliation range is negative one to positive one and is expected under most conditions to be positive for the member identity and negative for the non-member identity. For this reason, a uniform distribution with the respective full range was used for all the simulations in the experiment.

The initial average values for all the variables along with the actions taken were reported at the beginning and the end of the simulation. Perception values are included for both the member identity and the non-member identity so that variables affected by the respective actions can be explored to see under what conditions actions were taken.

Results

The results were tabulated in Excel so that pivot charts could be used to interactively explore the parameter space and resulting actions. The following series of contour charts show the average frequency of actions as plotted against the variables that appear to provide the most influence over the action selection.

The results in Figure 5 have an increased prevalence for when the individual esteem weight is high and the status of the out-group is high. This indicates that individual agents might have more to gain on the social component if they joined a different group.

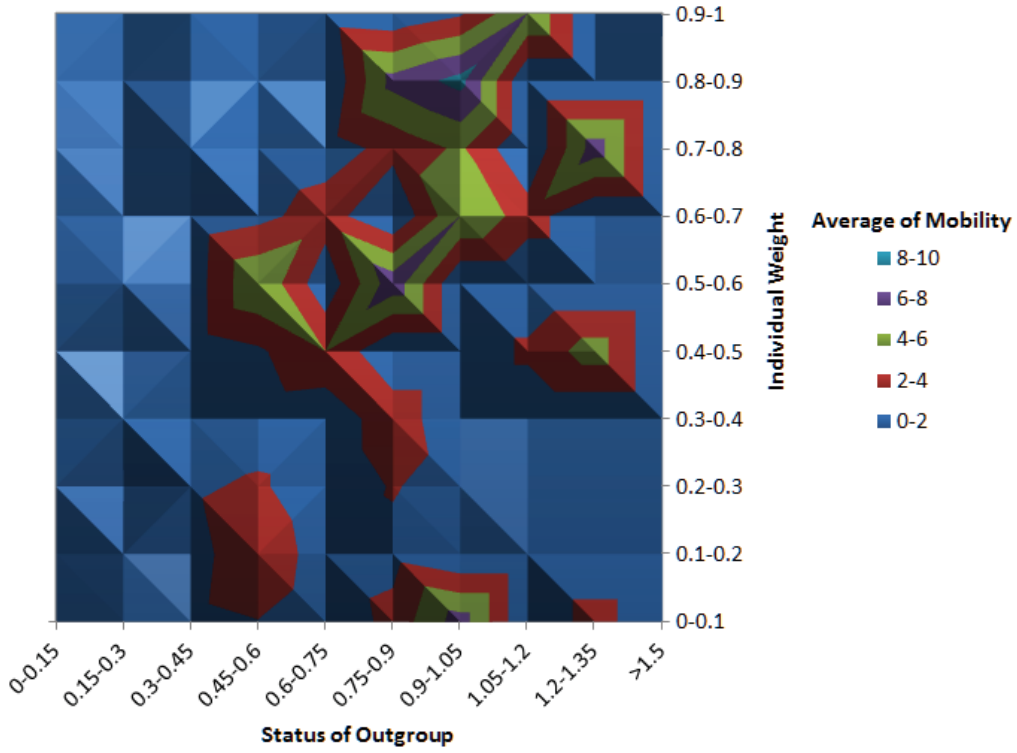

Figure 5: Mobility in relation to out-group status and individual esteem weight

The plot in Figure 6 indicates that when social esteem is high (i.e. individual weight is low), agents engage in more individuation. This is especially true when their affiliation with the identity is lower than average.

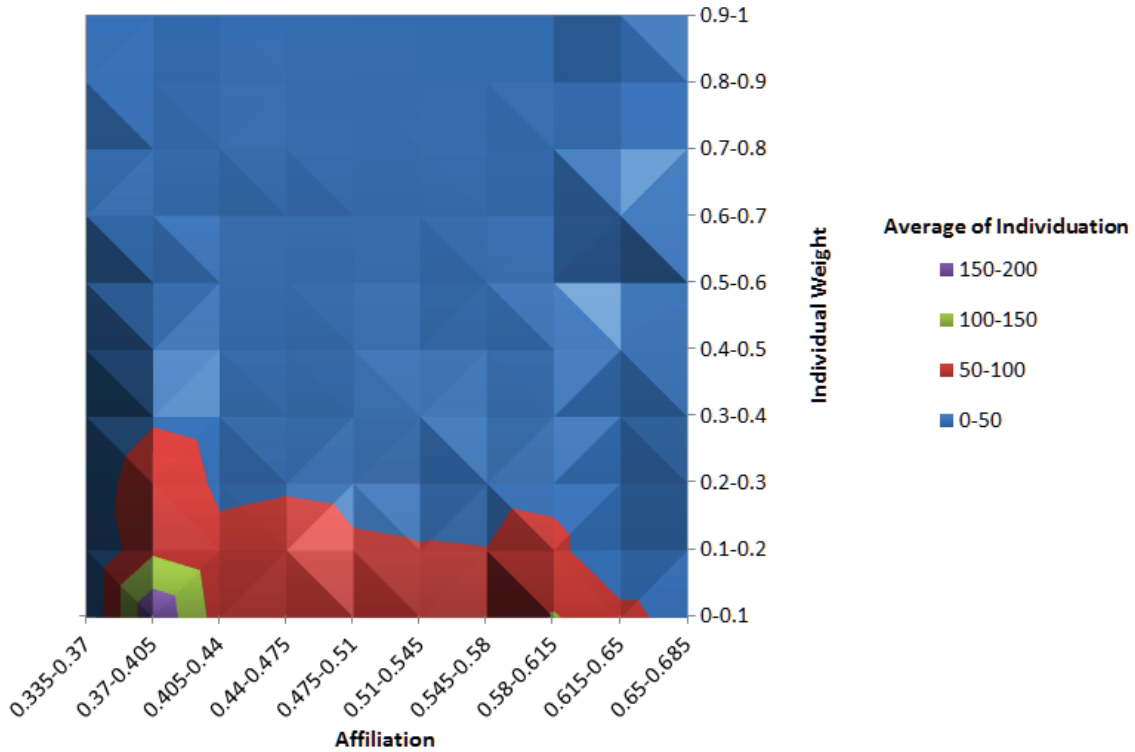

Figure 6: Individuation in relation to affiliation and individual esteem weight

In the case of deindividuaiton as shown in Figure 7, there is an increased prevalence when the affiliation with the group is stronger.

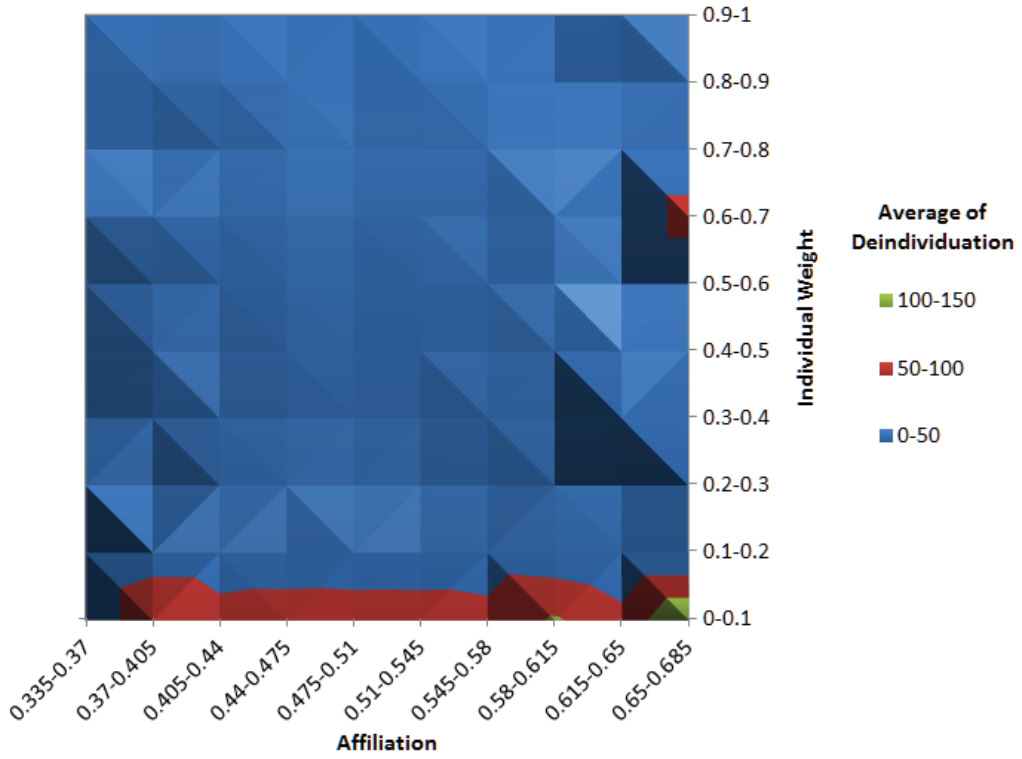

Figure 7: Deindividuaiton in relation to affiliation and individual esteem weight

When it comes to group actions, Figure 8 shows how raising boundaries (i.e. decreasing permeability) occurs more frequently when the weight for social identity esteem is high and the permeability is high (boundaries are low to moderate).

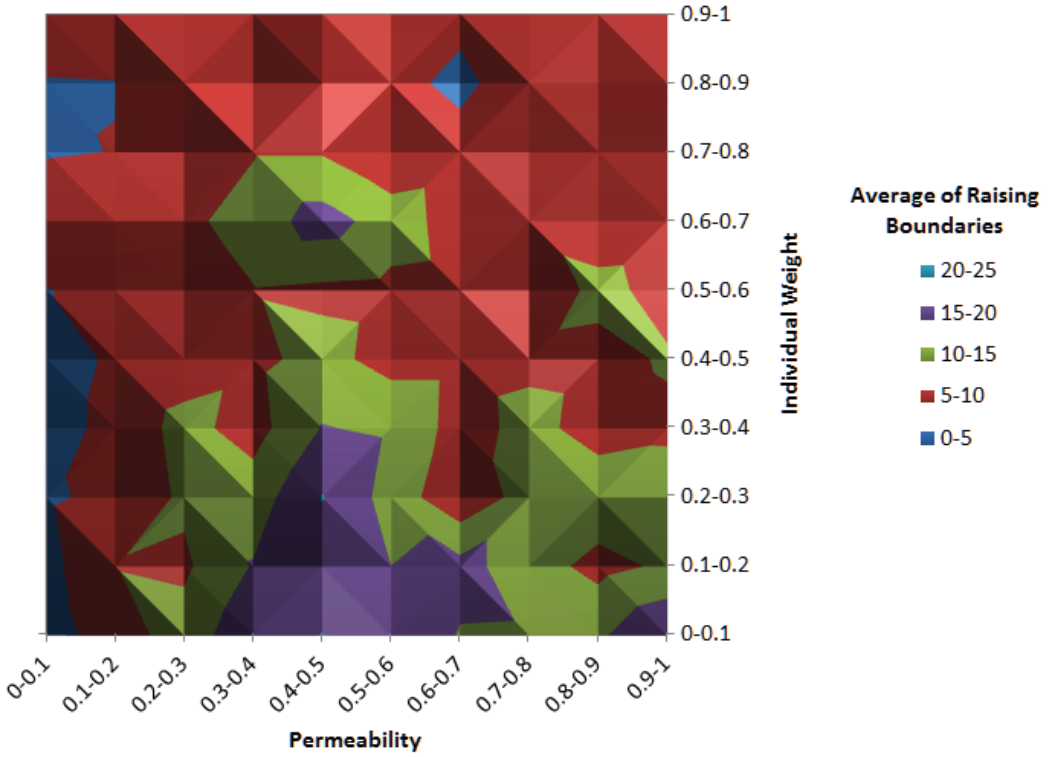

Figure 8: Raising boundaries in relation to permeability and individual esteem weight

For lowering boundaries, a strong social esteem weight also appears to drive the raising of low permeability values (Figure 9).

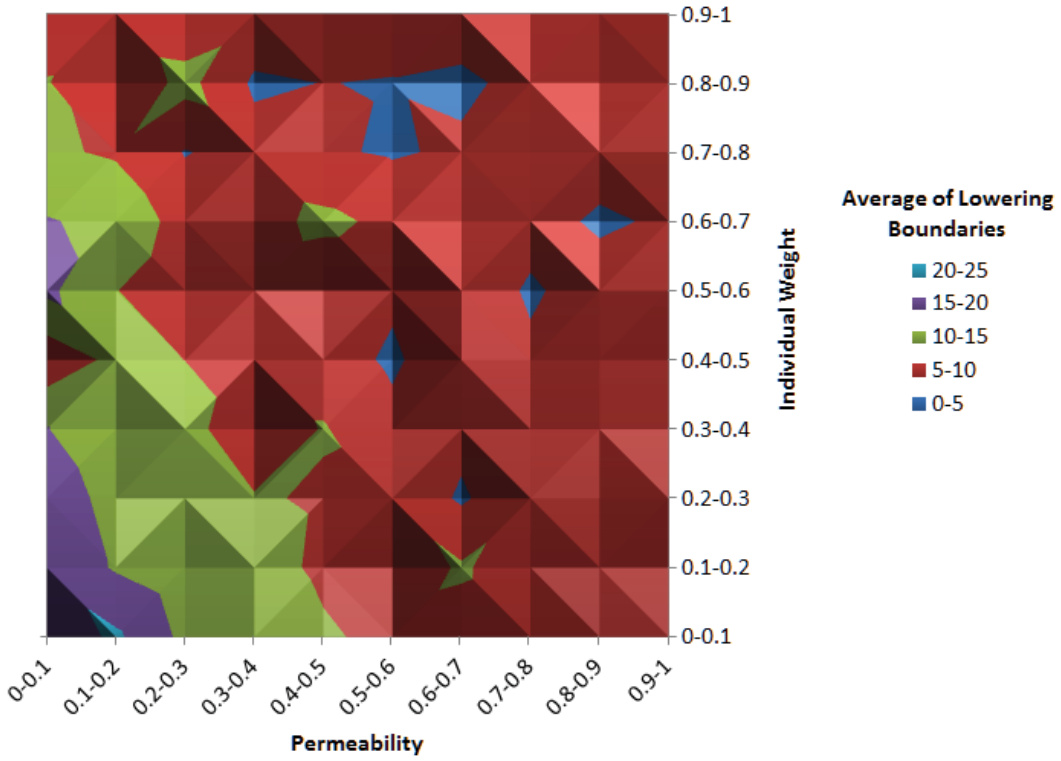

Figure 9: Lowering boundaries in relation to permeability and individual esteem weight

Also as expected, when legitimacy is low, there is an increased prevalence of glorifying as shown in Figure 10.

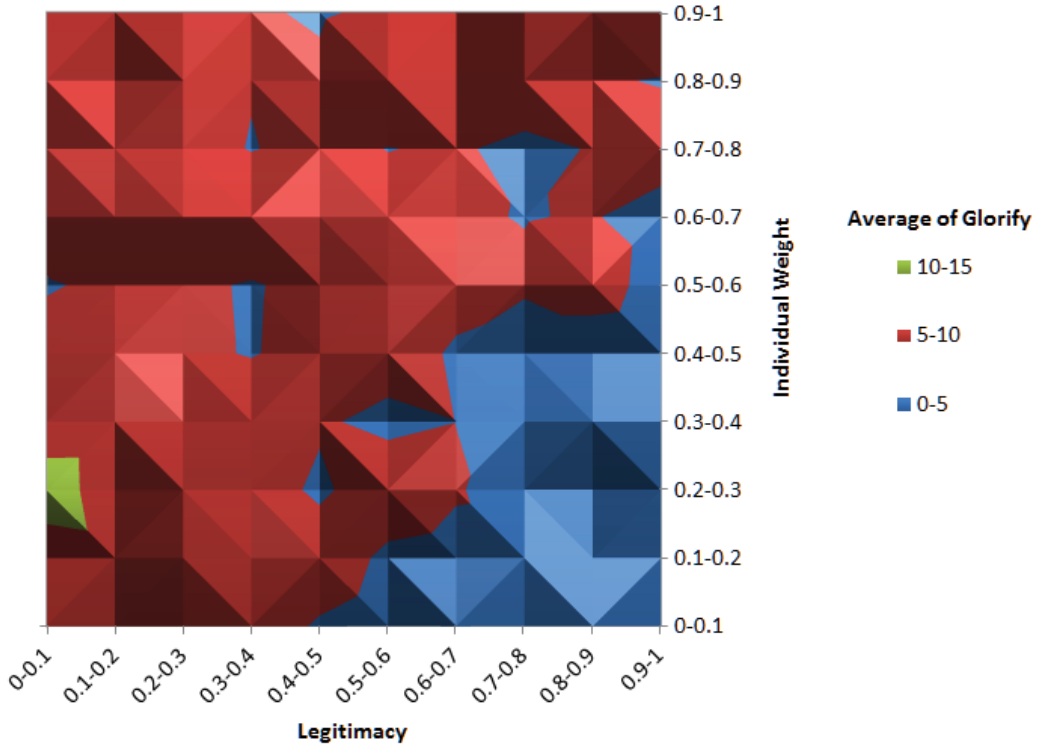

Figure 10: Glorifying in relation to legitimacy and individual esteem weight

The ability to attack appears to be driven by strong individuals with adequate resources as shown in Figure 11.

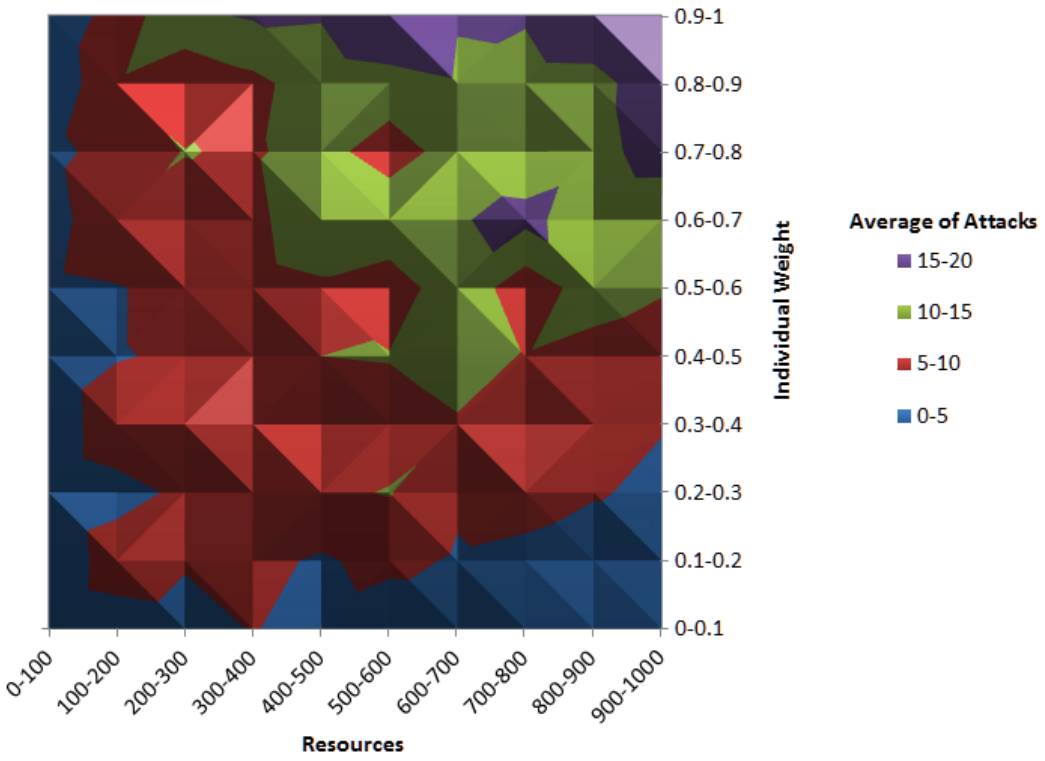

Figure 11: Attacks in relation to resources and individual esteem weight

When the out-group status is low, the chances of attack from a broader range of individuals are higher, but strong individuals also appear to have a preference for higher status groups (Figure 12).

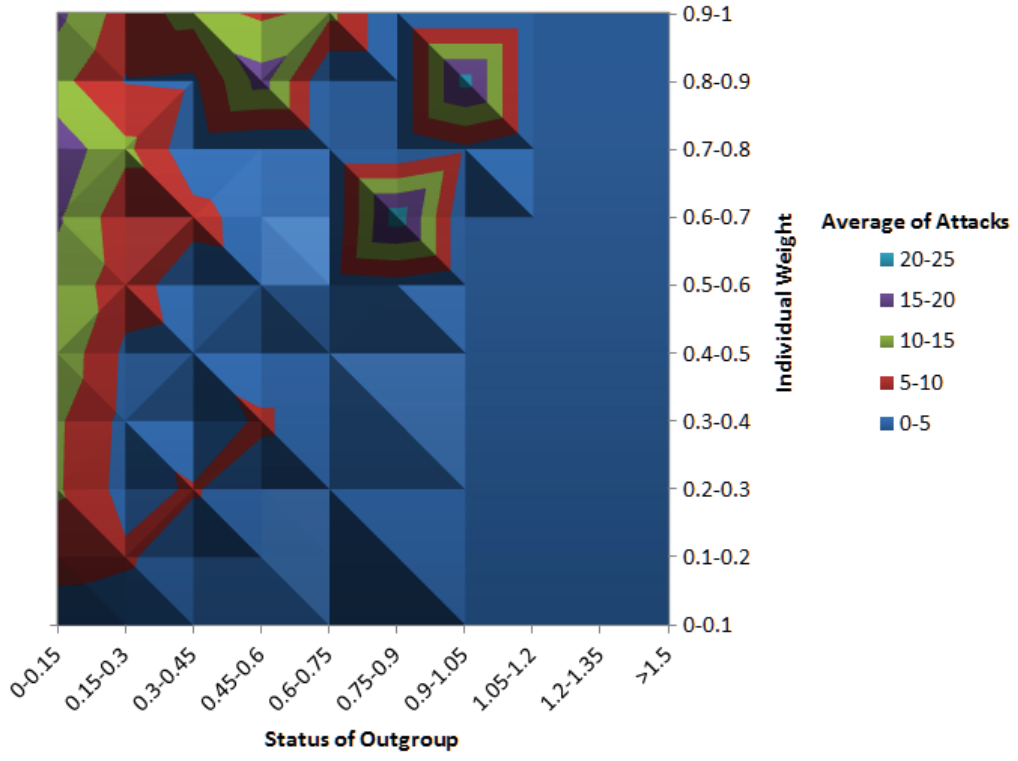

Figure 12: Attacks in in relation to out-group status and individual esteem weight

For delegitimizing (Figure 13), there does appear to be a higher frequency of actions when the perception of the out-group's legitimacy is high.

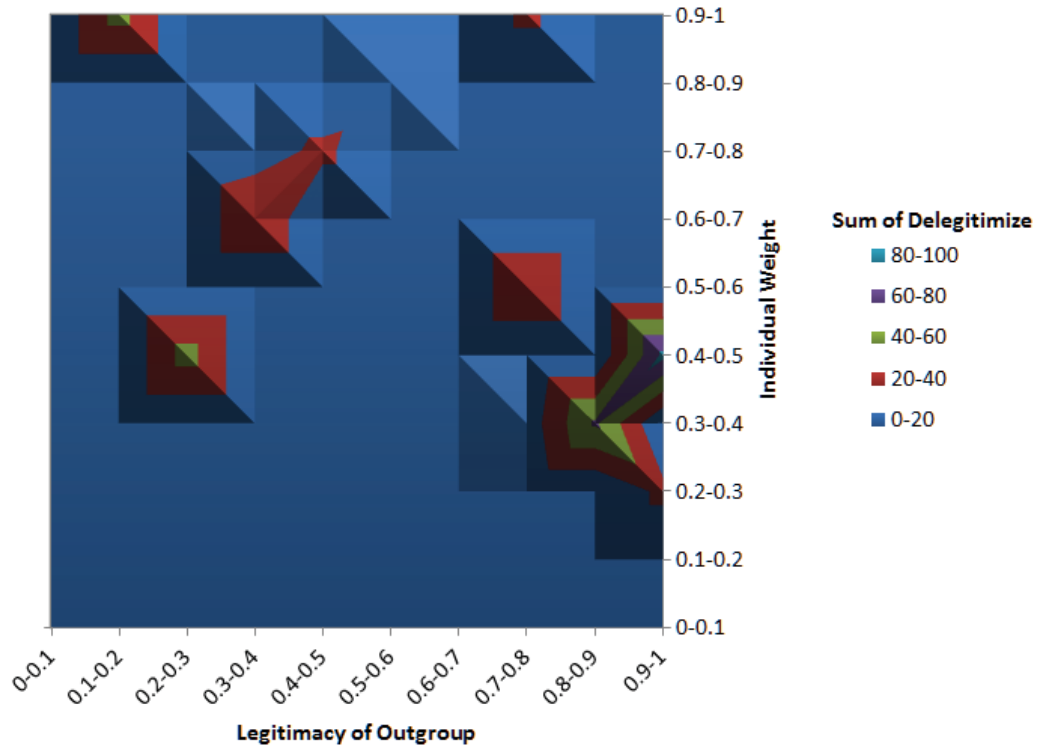

Figure 13: Delegitimizing in relation to out-group legitimacy and individual esteem weight

The frequency of denigrating actions is higher when the social esteem weight is higher, but there doesn't appear to be a desire to target only groups with highly stability (Figure 14).

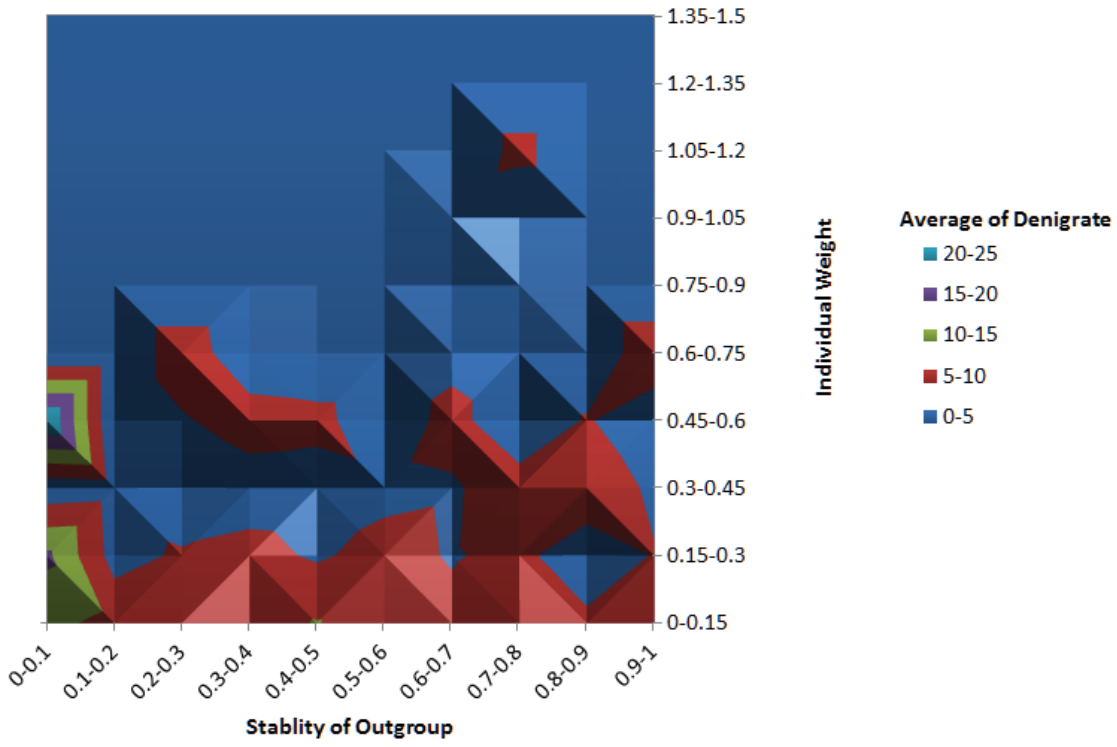

Figure 14: Denigrating in relation to out-group stability and individual esteem weight

Conclusion

The preliminary analysis demonstrates that the model is capable of simulating behavior that is consistent with the theory provided by the scientific authority. Under a variety of configurations the model was able to reproduce outcomes similar to those predicted by the theory. These results indicate that the model can be used within a learning lab environment to teach others about social identity theory and the different conditions within local populations that may be driving behavior. These findings also pave the way for additional research for exploring applications of real world scenarios within the model.

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